IDEAS ON A DECISION-INFORMATION SYSTEM FOR FAMILY PLANNING

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INTRODUCTION

Probably the greatest problem facing developing countries is how to control their population growth. This population problem has basically resulted from the use of technology (e.g. penicillin, vacination, DDT) to reduce epidemics and improve medical care. While the use of technology has caused the death rates to decrease, birth rates have tended to remain constant. In many developing countries efforts are being made to solve the resulting population problem.[1] In some smaller population control programs reduction in birth rates have been achieved (e.g. Hong Kong, Singapore, and Taiwan), but generally little significant change has occured in larger countries (e.g. India, Pakistan and Indonesia). For example, although the resources devoted to family planning in India have increased by a factor of 15 in the last five years to the largest expenditure in the world, the birth rate has decreased little if at all. In general, there is a great need for a co-ordinated effort to improve the effectiveness of family planning programs in developing countries. There is a need for better products, better programs and better management of these programs.

The purposes of this paper are to: (1) sturcture the family planning problems from a decision point of view, (2) indicate how management science and a model based information system can aid in

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[1] See Berelson [3].

improving the decision systems effectiveness, and (3) briefly outline the functions that must be carried out to establish such a system. It is hoped that these comments will encourage discussion and collaborative work on the management of family planning.

DECISION ELEMENTS IN THE FAMILY PLANNING SYSTEM

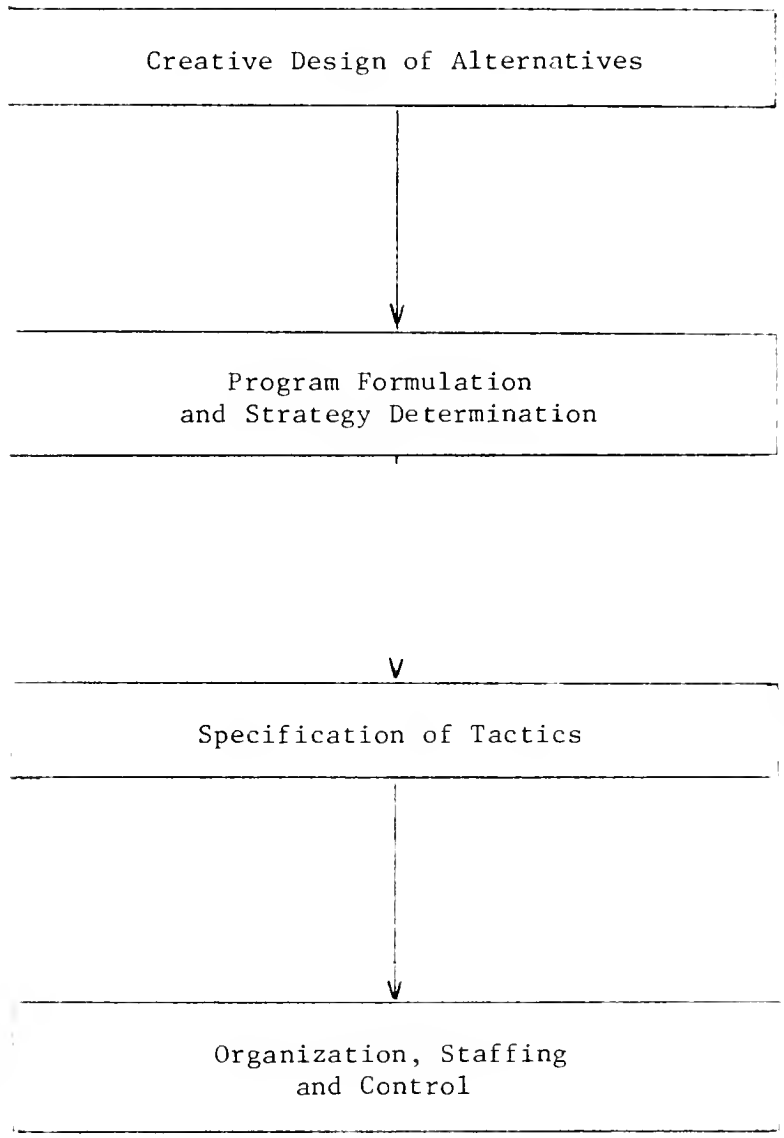
Assuming a national policy favorable to family planning has been established, four basic decision areas in family planning can be defined (see Figure One). They are: (1) Creative design of alternatives, (2) Program formulation and Strategy Determination, (3) Specification of Tactics, and (4) Organization, Staffing, and Control. This is not necessarily the order in which existing decision makers would proceed, but the purpose here is to normatively structure the family planning problem rather than provide a descriptive model of current decision practice. After discussing each decision, an information system will be specified to provide the basis for implementing the decisions.

Creative Design of Alternatives

Technology is improving the methods for contraception, but before these technological innovations are successful in the family planning program, they must be matched to the total needs of the users. This is not a simple task since the users are not homogeneous. The product preferences and acceptability to families vary by the number of living children in the family, the education level of the parents, and the geographic location of the consuming unit, (e.g. rural-urban, or states). For example, the segment of literate urban families may accept technologically advanced methods like the pill, although the large segment of illiterate

A Decision Structure for Family Planning

Figure One



rural families may be fearful of the pill or loop. Similarly, families with one or no children would find permanent methods unacceptable, while families with five children may find sterilization very acceptable. In general the segment's needs will be a combination of the physical needs and the social-psychological needs of the families in that segment. Efforts are needed to direct product design to each segment. A line of product alternatives should emerge which contain products targeted for specific market segments.

The design of product alternatives should not only be directed at the physical contraceptive features of the product. Creative effort must be directed at the social-psychological features reflected in the product's perception by consumers and its communication appeals. To understand the basic non-physical attributes of the product that are desired by users, careful behavioral science research is necessary. The basic family birth control decision making process must be identified. The active elements in the process, the husband's and wife's sources of information, and the family's decision rules must be determined. This will call for an understanding of the attitudinal and motivational aspects of the family components, as well as an appreciation of the cultural environment surrounding the family decision unit. For example, the nature of sex relationships, the practices of child rearing and training with respect to marriage and sex, the influence of religion and social norms, and the effects of over-all trends to organization, industrialization, more media availability, and wide spread education should be examined in terms of their effect on family planning decisions. In addition to

the study of individual decision units and the surrounding culture, the process of diffusion of innovation in the social system must be clearly understood.

The basic behavioral research tasks described in the previous paragraph become directly relevant to the design of family planning products through the creation of effective communication appeals and strategy alternatives. Communication must be carefully managed to produce impact. Most communication efforts have been able to generate awareness of family planning but have not been able to generate action. For example, in India current family planning communication methods can and have apparently generated approval[2], awareness[3], some knowledge[4], and the desire to limit family size[5], but they have not generated very much usage of contraceptive devices[6]. The translation of approval and desire into a depth of knowledge and then into action is paramount. This requires carefully designed appeals that activate the family decision units in each segment and motivate them to adopt family planning. It should be

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[2]Most studies in India indicate approval of family planning to be between 65% and 90%. For example see [1], [2], [12], [13] and for an extensive summary of studies of family planning in India see [15].

[3]Studies in India report that awareness of at least 60% to 70% can be obtained after communication efforts. See [1], [12], [13], [10], [20] and [15]

[4]Some degree of knowledge about contraceptive devises can be gained by communication efforts. Most studies report 40% to 60%. See [1], [2], [12], [13] and [15].

[5]The ideal family size is usually found to be about three (see [1], [4] [20]) while the actual average completed size is about six (see [19]). The percent of people who want no more than three children is usually reported to be high (between 70% and 95%). See [1], [19] and [2]. (However, see [6] who reports 42%).

[6]Most research studies report 15% to 25% after action or communication programs. See [1], [2] and [15]. In the overall India program about 12% of the eligible couples are protected, see [8]. Most of the usage is by the educated urban segment.

expected that the best appeals will be different in each segment and attention should be directed at each segment's differential characteristics. In the U.S. the best allocation of a total advertising budget to creation of the communication appeals is 10% to 15%.[7] In most developing countries the amount allocated to examining and creating effective appeals is less than one percent.

There is a need to allocate resources and test new contraceptive devices and to create communication appeals. In addition to total product design, creative effort should also be directed at creating channels of distribution to carry the product and specifying and creating media that will be effective in carrying the best communication appeal to each segment and each decision making element.

In summary, there is need for coordination between technical and social psychological product design. Alternative devices and communication appeals should be created and tested. The final psychological and social-psychological "bundle of utility" called the "product" should be aimed at specific target groups so that they will translate their approval into action. A "line" of products is probably needed to gain penetration into all segments. This need can be fulfilled by basic behavioral research systems to create and test appeals, and models to link physical product and communication linguistics in the generation of creative alternatives.[8]

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[7] See Gross [11].

[8] See Stefflre [23] for a model that has been sucessfully used in the generation of appeals for the U.S. Peace Corps in Peru and U.S. coffee products.

Program Formulation and Strategy Determination

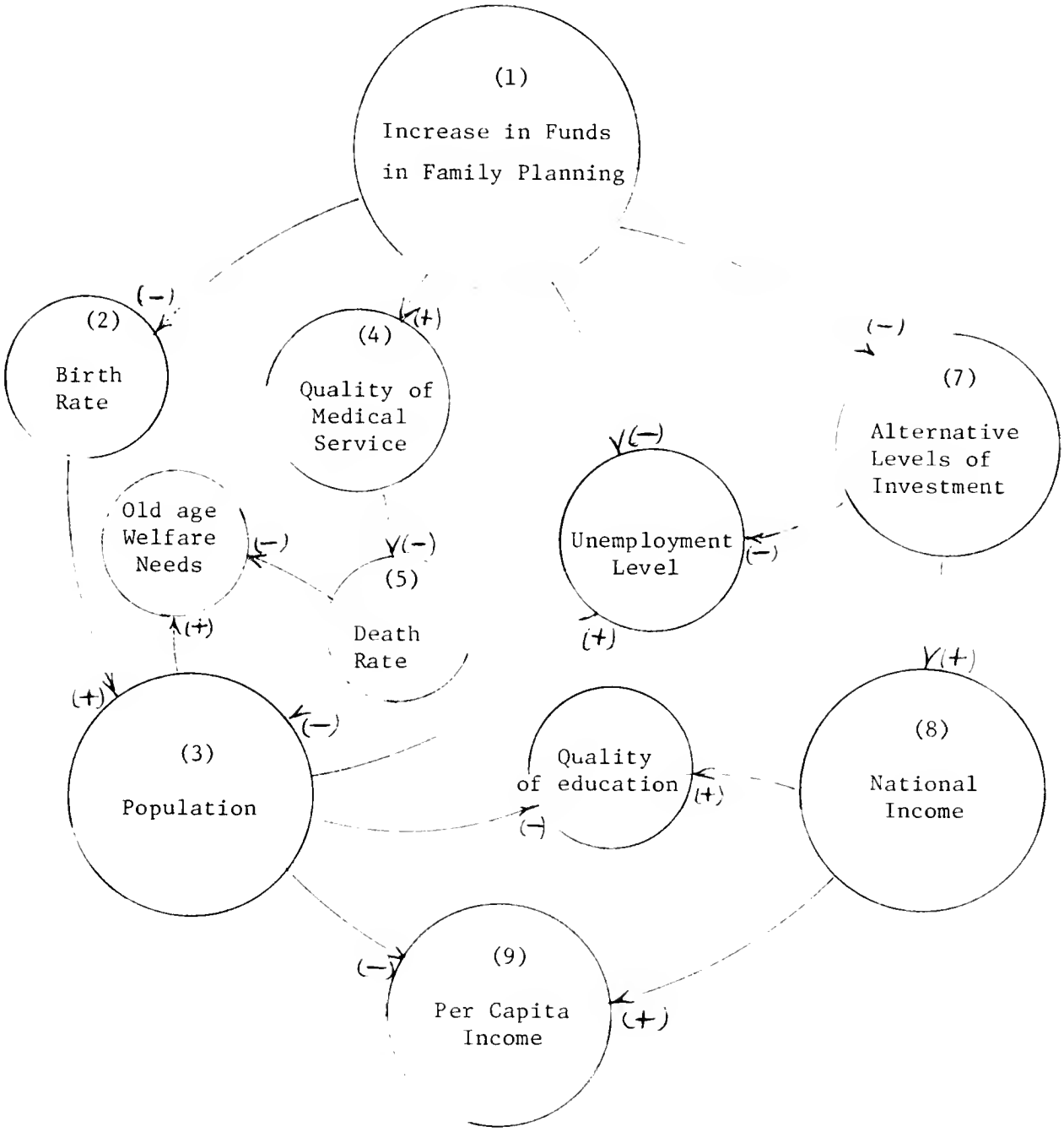
Given a set of creative product alternatives, the next problem is to select the best set of alternatives, mobilize resources to carry out these programs, and allocate these resources between alternatives so as to best achieve the goals of the family planning system.

In order to determine how much of a country's resources to allocate in the short run and in the long run, the interactions between family planning and the higher order goals must be considered. Economists have considered the marginal value of a birth prevented by evaluating the discounted value of net consumption, but this is a very elementary approach.[9] The inter-relationship between the goals of economic growth, social welfare, and social utility must be understood within the context of the system's behavior. Figure Two indicates some very simple examples of these interactions. An increase in funds in family planning will tend to decrease the birth rate (indicated by a negative sign between circle 1 and 2, showing an inverse partial causation). As the birth rate falls, the population growth rate tends to decrease (indicated by a plus between circle 2 and 3, showing a positive partial causation). But funds placed in family planning, such as setting up local medical centers, may also increase the availability of medical facilities (shown by a plus between 1 and 4) which will tend to decrease the death rate and therefore tend to increase the population growth rate. The population along with the national income is decreased since the original allocation funds to family planning was an alternative to other investments such as steel

[9] See Enke [7].

Some Simple Examples of System Partial Causations

Figure Two



production or fertilizers. Other possible interactions with old age welfare needs, unemployment, and education are also indicated. There is need of a comprehensive system model which will enable funding groups to determine the overall effects of alternative commitments of resources to family planning. The interactions between system elements shown in Figure Two are very simple and for illustration purposes only. For example, there is a more complex linkage between education and the birth rate. As the education level goes up the acceptance of family planning increases. As a further example of the complexities, if a social security system was operating to fill old age needs, perhaps the incentive of parents to have large families could be reduced and the birth rate would decrease. Finally, the effects of financing and foreign exchange would have to be included. A comprehensive model would include all the system interactions, the magnitude of the interactions, the delays in the system, and the effects of decision policies on the system.[10]

The use of such a system model will require a clear understanding of causation, but more importantly, the specification of realistic goals for family planning in terms of the country's total welfare. There has been a good deal of creation of "inspirational" goals in the programs of developing nations (e.g. reduce birth rate from 40 to 25 per thousand by 1975). But these must be balanced against resource availability within the system. The object is to produce meaningful goals for planning and control and the best budget for family planning in terms of a compatible total attack on the developing nations' problems.

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[10] See Forrester [9] for an approach to the problem.

example, condoms may be targeted for use by the newly married segment in urban areas, but the program might lead these people to choose the loop after having been convinced of the need for them to practice family planning, even though the loop was targeted for families with two or more children. The loop may over-lap with other alternatives such as legalization of abortion. Perhaps abortion could be used as a guarantee of birth prevention if a user of the loop becomes pregnant. These conglomerate alternatives reflect program interdependencies and must be considered in the allocation of the total family planning budget if the greatest birth rate reduction is to be achieved.

The problem of program specification can be attacked by management science models. Such a program formulation model must also consider specific strategies for each program since the allocation to a program will depend upon the usage of that allocation in the specific program. For example, what level of advertising should be used? How much supply capacity should be established? What price should be set? How much should be paid to intermediaries? If a program is to be a success the controllable variables indicated in these questions must be set correctly. As a further example, the training quality is a variable in a public health education program. If the duration of the training is longer, the quality of field workers will rise, but so will the cost; is it worth it? The strategy model must answer this question by linking the response of better training to the program results, and onto the total results achieved with a set of programs given the budget for family planning. The objective is to find the most effective

allocation to the best set of programs and the best level for the controllable variables in each program, given the financial, production, technical, and personnel constraints on the system.

In addition to these constraints there may be policies that restrict the number of alternatives. For example, the policy of voluntary participation may eliminate negative incentives such as penalties for having children, or manditory sterilization after four children. Another policy limitation might be strictures against abortion on moral or religious grounds. The constrained allocation is a difficult task since many variables, programs, and market segments are involved and because the basic environment of family planning is a dynamic one in which the elements are inter-dependent. In addition, a model for strategy determination must reflect the basic behavioral decision process that begins with awareness and knowledge, leads to intent and trial, and ends with adoption of family planning. A final complexity is that the strategy is not a set of actions for one period. The strategy must specify a set of activities for each of a number of periods so that the best timing of the birth reduction and population growth is achieved. Although complex, such problems can be structured through management science models.[11] A good program formulation and strategy determination model could aid in finding an integrated set of programs which effectively utilize the available alternatives and resources to best achieve the national goals.

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[11] These types of models have been used successfully in new product decisions in the U.S.A., see Urban [24] and [25]. For a specific application to family planning see [26].

Specification of Tactics

Once the programs are designed and their strategies are defined, many tactical decisions are necessary to carry out these strategies. For example, although the advertising level of an alternative has been set, this budget must be turned into a specific media schedule. This scheduling must consider the target groups or segments to be reached, the exposure of media to the group, the cost of insertions, the duplication between media, the effects of replication, and the over-all gains in terms of program goal achievements. This type of complex decision can be solved by a media selection model. Experience in the U.S.A. indicates that such a model can improve the effectiveness of a media schedule substantially.[12] Models can also be useful in other tactical decisions such as logistics[13], the formulation of communication material formats[14], the allocation of public health facilities and personnel to geographic areas, and the determination of the level of inventories of contraceptive devices in the production and distribution system. Tactical decisions must be coordinated and controlled. To aid in this planning and control, PERT and Critical Path methods would be useful for tactical decisions in new programs. For example, PERT would be useful in assuring a coordination between the availability of new contraceptive devices with media insertions and communication efforts. The success of

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[12] See Little and Lodish [16].

[13] See Shycon and Maffei [22].

[14] See Diamond [5].

a strategy depends upon good tactical decisions, and management science models can help managers improve the quality of these decisions in family planning.

Organizing, Staffing and Control

After design, strategy, and tactical decisions have been made, they must be implemented. This implementation requires a large and effective organization. This is a problem in institution building. The institution must function as a change agent. This institution building is particularly important since the scale of the problem is so large. For example, at least 100,000 people are working in the public health family planning activities in India. This implies many levels in the organization, suggests the consideration of some decentralization of decision making, and requires specific programs to motivate organizational members.

Organizationally the program formulation and policy specification decisions would probably be centralized in a specific top level group which has only this task, but some strategic, many tactical, and many control decisions could be delegated, to enable an appropriate motivation and evaluation system to be designed. For example, making a specific manager responsible for each specific program's performance would be desirable. This person would have a planning responsibility for the program. He would be the source of new plans and changes in strategy and tactics. He and his staff would be responsible for the overall performance of the program. Since several programs would be active, the goals and constraints of each program should be clearly specified so

that the manager would be realistically evaluated and motivated. These goals and constraints would be generated in the program formulation stage and based on realistic plans, so they should be useful guidelines for the evaluation of performance. The motivation and control should permeate throughout the organization. Reasonable goals and constraints should be set and each decision maker given reasonable and sufficient degrees of latitude to affect his goal. In this way he would be motivated to search for creative ways of improving his performance.

The staffing of such an organization would be important and difficult since it calls for creative and talented managers. Personnel who could recognize problems and make good decisions would be needed. This implies the need for training of managers and a high incentive system to attract qualified people who would be willing to join the organization.

In order to control this organization, data would have to be collected to monitor resource usage and goal achievement at each level. This control system would also function to direct a flow of required information to each manager so he could make sound decisions. It would also function to monitor changes in the environment. These would be fed back to the strategy determination decision phase so that adaptive planning could take place. This would insure that the system remained responsive to changes in the environment.

Information systems that will assure the decision maker of timely, accurate, and relevant information can be developed with today's technology. Such a system would function to motivate and control all levels of operation,

satisfy managers' needs for decision relevant information, and foster adaptive planning.

Summary of Decision Structuring

There is a great potential to improve the management of family planning in the design, program formulation and strategy determination, tactics specification, and organization staffing and control decision areas. Coordinated technical and behavioral research programs can lead to creative product alternatives that reflect a match between the total needs of various target segments of users and technical contraceptive features. The output would be an integrated product with physical characteristics and social-psychological appeals that would be communicated to the target segments in such a way as to cause trial and adoption. Program formulation and strategy determination can be improved by management science models that help managers determine the best resource commitment for family planning and allocate these resources in the best way to the set of program alternatives. The programs would function as a product line to achieve the total family planning birth goals by their cumulative effect in designated consumer segments. The strategy for each program must be set so that the level of each controllable variable is best in terms of the product line's contribution to birth reduction. This type of planning must be backed by an effectively structural and staffed organization. Information systems can aid in the motivation and control of this organization, as well as, assure a complete, accurate, and timely flow of information to decision makers.

THE FAMILY PLANNING DECISION-INFORMATION SYSTEM ELEMENTS

The Man-Information Interaction

In order to support a large scale decision system such as the one described for family planning, a large amount of data is needed. But data must be made relevant to the decision maker. This requires a "man-information" interaction. The "man" is the manager and his organization who have a problem or decision to make. The "information" is contained in an information system that responds to his demands and needs. This information system attempts to translate environmental information into a more relevant form. The manager questions the system and the system replies with information. See Figure 3.

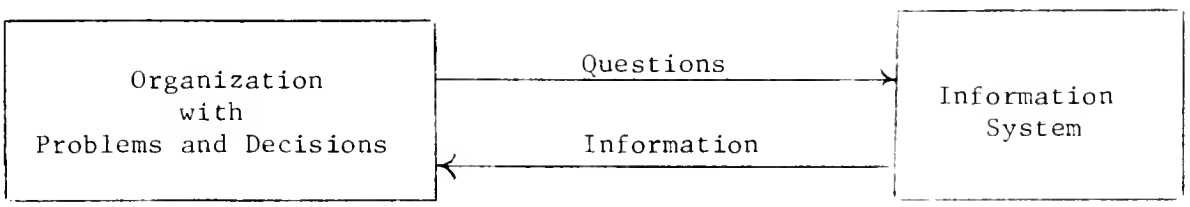
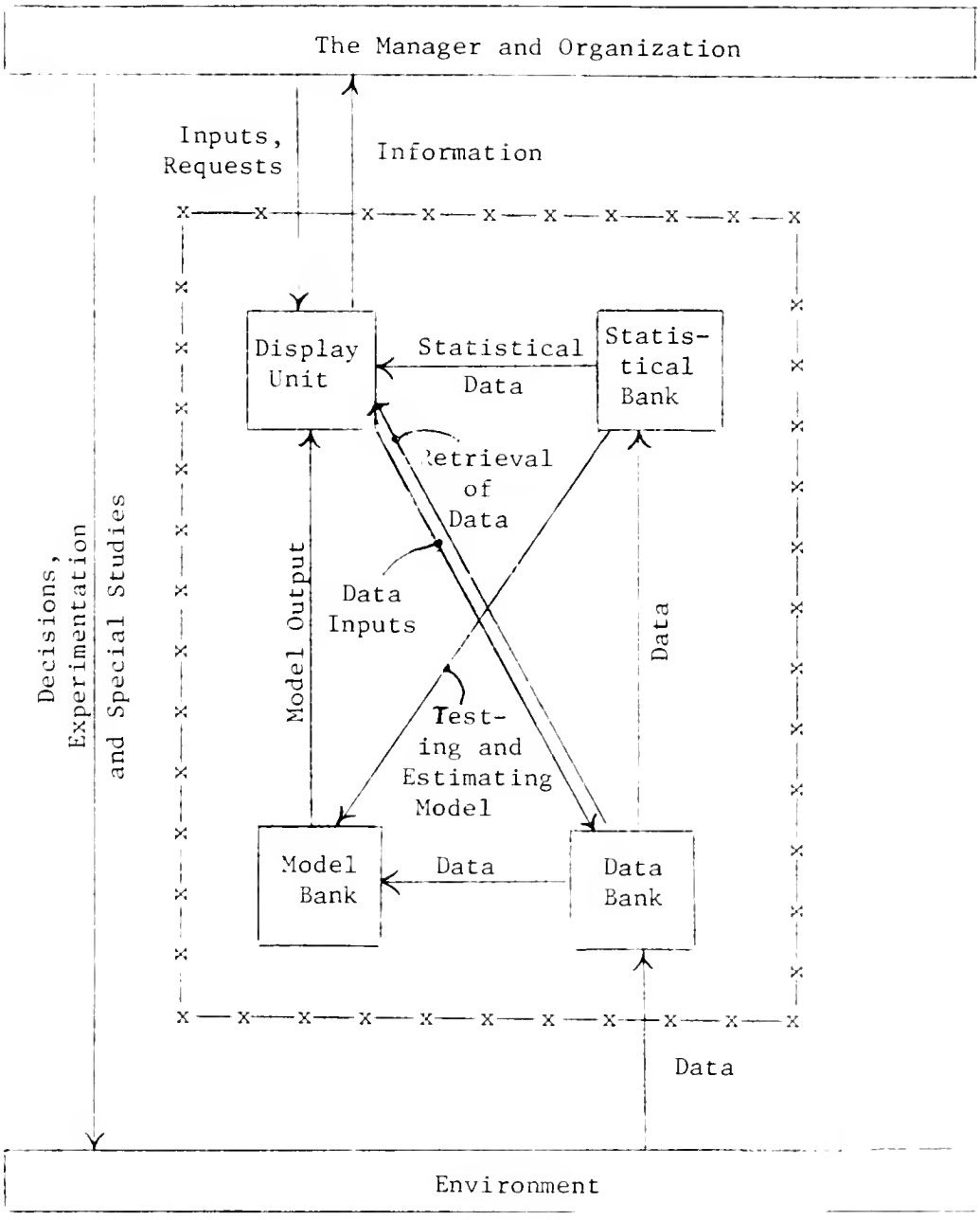


Figure 3: Decision-Information System

The information system is made up of a number of internal components. Within the system are a data bank, a statistical methods bank, a model bank, and a display unit. These internal components interact with two external elements - the manager and the environment. The environment includes all the conditions, activities, and influences affecting the firm. These components are depicted in Figure 4.

Figure 4: Components of Decision-Information System*



*Adapted from Montgomery and Urban [17]

The environment is monitored by the information system and the resulting data are stored in a data bank. These data can be examined by the manager through the display unit after being retrieved from the data bank. A simple system depicting this retrieval function is a series of filing cabinets containing records of environmental activity. The manager can retrieve this information by instructing his secretary to find a particular file and deliver it to him. The physical file is then the display unit, and the secretary serves the retrieval function with the filing cabinet functioning as the data bank. A more complex system might be a computer based system that displays data on a television screen in the manager's office, the retrieval being performed by a computer program searching the magnetic disk records that make up the data bank.

The manager may not be interested in the raw data per se. For decision purposes he will generally require the data to be processed in some manner. In the simplest case, he may want totals or averages. More complex manipulations, such as multiple regression or contingency tables, might also be desired. These are carried out within the system by the use of a statistical methods bank. This bank would have the capability of statistically manipulating the data and displaying it in the desired form on command from the manager. The data transformed in this manner may also be sent back to the data bank to be stored for retrieval or use at a later time.

The manager may address the system with a request for information that is interpreted in terms of a particular decision. A model bank would contain management science models that are designed to solve particular

problems. He can call upon one of these models to transform input data from the data bank in the hope of achieving help in understanding and solving his problem. These input data may be the original data or they may be the output of a descriptive or predictive model. The model output would be displayed and could then be stored in the data bank for future retrieval and display. If the manager is not satisfied with the retrieved, statistically manipulated, or model-generated data, he can initiate tests that will generate new data. His requests for experimentation in the external environment will generate results that will be monitored by the system and stored in the data bank. The new data may then be displayed for the manager's use in making decisions, formulating new models, and understanding his environment. With this brief outline of the information system, each component will now be analyzed in more detail with respect to the family planning problem.

The Data Bank

The data bank represents the system's first contact with the environment. The data bank serves as a storehouse for the information that the organization views as important for its decisions. The data bank must contain data relevant to the design, program formulation and strategy determination, tactical, and control decisions in family planning.

Figure 5 gives an example of the composition of such a data bank. The first section is vital statistics on births, deaths, fertility spacing of children, imigration, and emigration. These statistics are needed to accurately reflect population changes and forecast future population levels. As is well recognized, the conventional registration systems do not give

Hypothetical Data Bank
for Family Planning

Figure 5

1. Vital Statistics

   Births, deaths, imigration, emigration, fertility, spacing of children, age of marriage, age and sex composition.

2. Internal Data

   Expenditures, cash flow, accounting data, contraceptive placements, inventories, report of district and local level family planning center activities.

3. Regular External Data

   Diaries of field workers, doctors' diary of work, register of elligible couples.

4. Special Data

   Behavioral science research results, tests of new products, experimental testing results, audits of retail stores, awareness, knowledge, attitude and usage studies.

accurate measures of these statistics. Special sample surveys conducted on a regular basis would be needed. The surveys would have to be of sufficient size to give the vital statistics for each consumer segment defined in the decision analysis (e.g. education, number of children and area). The second section contains internally generated data on expenditures, cash flows, media insertions, records of contraceptive placements, inventories, and reports of medical center activities. This data is needed for control and for accurately determining the results of strategy planning. The third data are external data that is regularly collected but not usually internalized. Examples are the diaries of field workers, the work books of medical teams, and a register of all eligible couples. This disaggregate data after being properly validated is a valuable store of information. For example, the doctor's work book probably would contain person by person reports of loop insertions and removals. The data could be analyzed to find out the frequency of removals of the loop, the proportion of side effects, and the segments of people having side effects. The amount of data in this third group is very large, but probably only an accurately maintained and controlled sample of such data would actually reside in the data bank.

The last and perhaps most important set of data is the results of special studies. These studies are carried out to supply response information necessary for the major family planning decisions. A store of behavioral science studies on motivation, cultural patterns, family decision making, and diffusion of innovation would be available to support design and strategy decisions. Tests of new products and their appeals

would be available and necessary to access the impact of new programs and their relationship to other products. Special response data resulting from the actual experimental variation of controllable parameters in various local areas would be vital to the specification of best strategies of family planning programs. Finally awareness (including media exposures to various segments), knowledge, attitude, and usage studies would be needed to supply behavioral input to the models for strategy determination and the specification of tactics. This data should be collected on a sampling basis for each segment of the market and on a continuing basis so that changes in response can be quickly monitored and adaptive behavior can effectively take place.

The Statistical Bank

Information in the data bank may not be directly relevant to a particular decision maker in its raw form. Averages, trends, or aggregations may be needed. The statistical bank must have these simple capabilities, but it must also be able to analyze the significance of the sample data collected. Most importantly it would determine the response effects of the controllable variables by the use of multivariate statistical methods. The accomplishment of these functions is complex but possible through statistical procedures.[15]

The Model Bank

The model bank is designed to help a manager understand and solve his problems. The models are representations of the environment and the

[15]See Montgomery and Urban [17], pp. 22-24 for more detailed description of a statistical bank.

decision variables in it. It should be pointed out that all decisions are made on the basis of models. The decision maker, whoever he is, has a perception of how the environment works. This is his model. Although this may be implicit and difficult for him to define, it nonetheless is his decision model. The information system, however, will function to make the implicit model explicit by placing them into logical flow and mathematical forms. This allows the manager to expand his model and extend his ability to make difficult decisions.

A number of models have been discussed in the decision structuring section of this paper. The usefulness of these models as specific decision aids was presented, but models also serve as a basic mechanism of understanding problems, since they (1) require the explicit recognition and identification of problems, (2) cause managers to openly define all the elements in the problem and how they relate, (3) lead to decisions to collect actual data and transform these data into relevant information, (4) allow managers to formulate and test hypothesis about the system, (5) provide a basis for discussions and (6) lead to a common understanding of the problem. With an accurate understanding of the problem and its structure, more accurate forecasts can be made by the use of predictive models, and finally better strategies and tactical decisions can be made with the help of models that recommend best courses of action. Figure 6 gives an example of the composition of a hypothetical model bank in terms of the models that were discussed in the decision structuring of family planning.

A Hypothetical Model Bank
for Family Planning

Figure 6

Design of Alternatives

- Simulation of family decision process
- Descriptive diffusion model
- Non-metric scaling model
- Experimental appeal testing models

Program Formulation and Strategy Determination

- System budgeting model
- Resource allocation and strategy model
- Micro-analytical simulation of users

Tactics Specification

- Media selection model
- Personnel allocation model
- Inventory model
- Production-distribution simulation
- Production cost minimization model

Organization and Control

- Adaptive control model
- Descriptive model of organization decision procedures and information flows

The Man-System Interaction

This discussion of the components of the information system has now led to the point of interaction between the system and the manager. The design and specification of the system are oriented towards the manager and his needs. To design the system components such as the model bank, a clear understanding of the demands on the system is needed. The manager's demands will depend upon the relevant problems he faces and the decision structure he uses in approaching the system. The most elementary decision demands on the system will be with respect to data retrieval and an assessment of what the present family planning situation is. This may widen to a need to understand the underlying phenomena of consumer behavior. At the next level, the manager may desire the ability to forecast marketing events. The highest level demands on the system are problem-centered demands.

A manager may approach the system with a formal decision structure. For example his procedure may begin with problem recognition and definition, proceed through the process of generating, assessing, and selecting from alternatives, and end at testing, implementation, and control of the decision. At any point in this structure, the manager may request information and guidance from the system. The system should be designed so that a manager may approach the system and interact with it to solve the relevant problems of family planning.[16]

The man-system interaction is an organization system interaction, so care must be taken in the design of the system to assure that the flow

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[16] See Morton [18].

of information, inquiries, and decisions function to produce an effective implementation of planning and control procedures.

Summary of Information System Elements

A decision information system containing a data bank, statistical bank, model bank, and effective input/output capability can lead to a meaningful attack on the major design, program formulation, strategy, tactics and control decisions in family planning. It is essential that such a system must be "man" oriented so it can lead to better understanding of problems and an improvement in the decision methods for solving of problems in family planning.

DEVELOPING THE DECISION INFORMATION SYSTEM

Given that the management of family planning could be improved by a decision-information system, the next question is what would be necessary to develop such a system. Four basic functions must be carried out: (1) data collection, (2) system and model design, (3) behavioral science research, and (4) implementation.

The data collection task implied in the specification of the systems data bank is very large. Continuing and validated national data channels would have to be implemented. Primary data collection instruments would have to be developed. Sampling procedures and experimental designs would have to be specified. This implies a large expenditure of funds, a trained field staff of interviewers and capable administration of the data collection function. The demographic sections of the data base could be the responsibility of an indigenous agent. As well, in some developing

countries there are some commerical market research firms capable of carrying out some of the behavioral and experimental data gathering and a number of academic institutions (e.g. Indian Statistical Institute) who could help. But basically a large input of funds for data generation and a commitment of people to the function of data collection is necessary.

The information system and model building function requires a high degree of technical expertise and computer capacity. The previous sections have outlined an information system but this is not a complete description of what should be included. A full set of system design specifications must be formulated and then these specifications must be converted into actual models. There are some schools in some countries where such work could take place (Indian Institute of Management). But the major input would be required from foreign management and population centers working in collaboration with indigenous institutions and decision makers.

This collaboration should involve active participation from all institutions in the design and co-ordination of all phases. One member may be better equipped to carry a particular function. For example, foreign schools may best provide the computer related work while local groups can best carry out the basic behavioral research and cultural analysis. The collaboration should use each partner's best abilities, but it should also serve to build and widen each institution's capabilities.

The most difficult task is implementation of the system. If a decision system is not used it is a failure no matter how academically rewarding its development may have been. Therefore, a separate set of resources would be required for training existing and new managers in

the system's usefulness and operation. The decision makers must be convinced that the system's sole function is to help them and that there should be no fear of it. Necessarily, this education and implementation process interacts heavily with the system and model design. The actual decision maker should be the prime determinant of the problem specifications, factors to be considered, model structure, and input information. The system should start on a small and simple scale and then evolve to the total system described in the first two sections of this report. During the system's evolution, effort should also be directed at making the transfer of the system's technology and experience to other countries.

The implementation function would require full time personnel responsible for liason with system designers and decision makers. In addition, private management resources in developing countries could be encouraged to contribute managers and knowledge to the system (e.g. Union Carbide, Lever Brothers). Finally, formal training programs by management institutions should be instituted to aid in staffing the system and management positions with creative, mature, and intelligent decision makers.

In summary, in order to implement a decision information system for family planning, data collection resources would have to be generated, collaborative system development would have to be established, behavioral research capabilities would have to be organized, and finally along with a special group for implementing the system, all institutions active in the program would have to assume a share of the most important task of implementation.

CONCLUSION

If a decision information system can be designed, supported by good data and behavioral research, and implemented, the quality of the management of family planning should be increased. By improving the design of creative products and appeals, the methods of program formulation and strategy determination, the specification of tactics, and the organizing, staffing and control of the effort, management science and information systems should make a meaningful contribution to the reduction of birth rates in developing countries.

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